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What attracts human capital?

Understanding the skill composition of interregional job matches in Germany

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By examining pecuniary and non-pecuniary factors in the destination choices of heterogeneous job movers, this paper tries to explain the skill composition of interregional job matches in Germany. It thus provides insights on how policy can affect the spatial allocation of human capital to promote convergence between regions such as eastern and western Germany. Estimates from a nested logit model suggest that the spatial pattern of job moves by high-skilled individuals are mainly driven by interregional income differentials, while interregional job matches by less-skilled individuals are mainly determined by interregional differentials in job opportunities. The role of regional amenities in attracting high-skilled labour turns out to be less clear.

Keywords: destination choice, spatial allocation of human capital, convergence

吸引人力资源的是什么？理解德国区域间工作匹配的技术构成，区域研究。通过考察不同择业者在目的地选择中的特别及非特别要素，本文试图解释德国区域间工作匹配的技术构成。文章因此分析出政策是如何影响人力资本的区位选择进而促进区域间（例如东、西德的）相互融合。由嵌套逻辑模型得出的估计值表明，与高技能个体相关的就业转移的空间模式主要由收入差异引发，而低技能个体与区域间工作的相互匹配主要由就业机会的区域间差异决定。区域环境友好性在吸引高技能劳动力上的作用不甚明了。

目的地选择　人力资源的空间分配　融合

Qu'est-ce qui séduit le capital humain?: comprendre l'ensemble des compétences des emplois correspondants interrégionaux en Allemagne.

En examinant des facteurs pécuniaires et non-pécuniaires quant à la destination des individus à la recherche d'emploi hétérogènes, cet article essaye d'expliquer l'ensembles des compétences des emplois correspondants en Allemagne. Il fournit donc des aperçus sur la façon dont la politique peut influer sur la distribution géographique du capital humain dans le but de promouvoir la convergence des régions, telles l'est et l'ouest de l'Allemagne. Des estimations provenant d'un modèle du type logit emboîté laissent supposer que les écarts du revenu régional sont le principal moteur de la distribution géographique des déplacements à la recherche d'emploi par des individus hautement qualifiés, alors que les emplois correspondants inter-régionaux des individus moins qualifiés sont déterminés dans une large mesure par les écarts inter-régionaux des possibilités d'emploi. Il s'avère que le rôle des équipements régionaux dans l'attraction de la main-d'oeuvre hautement qualifiée est moins évident.

Choix de destination / Distribution géographique du capital humain / Convergence

Was zieht Humankapital an? Verständnis der Zusammensetzung von Qualifikationen bei der interregionalen Arbeitsvermittlung in Deutschland

Durch eine Untersuchung von pekuniären und nicht pekuniären Faktoren bei der Standortwahl heterogener Arbeitsplatzwechsler wird in diesem Beitrag versucht, die Zusammensetzung von Qualifikationen bei der interregionalen Angebots- und Nachfragesituation auf dem deutschen Arbeitsmarkt zu erklären. Auf diese Weise werden Einblicke geliefert, wie die Politik auf die räumliche Zuweisung von Humankapital einwirken kann, um die Konvergenz von Regionen wie Ost- und Westdeutschland zu fördern. Die Schätzungen eines Nested-Logit-Modells lassen darauf schließen, dass das räumliche Muster des Arbeitsplatzwechsels von hochqualifizierten Personen in erster Linie von interregionalen Einkommensdifferentialen abhängt, während die interregionale Arbeitsplatzsuche weniger qualifizierter Personen vor allem von interregionalen Differentialen hinsichtlich des Arbeitsplatzangebots beeinflusst wird. Die Rolle von regionalen Einrichtungen beim Anziehen hochqualifizierter Arbeitskräfte erweist sich als weniger klar.

Keywords:
Standortwahl
Räumliche Zuweisung von Humankapital
Konvergenz

¿Qué atrae el capital humano?
Entender la composición de habilidades de adaptación laboral interregional en Alemania

Al examinar los factores pecuniarios y no pecuniarios en la elección de destinos por parte de las personas heterogéneas que cambian de domicilio por motivos laborales, en este artículo intento explicar la composición de habilidades de la demanda y oferta laboral a nivel interregional en Alemania. De este modo, expongo una perspectiva de cómo puede afectar la política a la asignación espacial del capital humano para fomentar la convergencia entre las regiones, tales como el este y el oeste de Alemania. Las estimaciones de un modelo logit anidado indican que el modelo espacial de movimientos laborales de individuos altamente cualificados está impulsado principalmente por diferenciales de ingresos interregionales, mientras que la demanda interregional de empleo por personas menos cualificadas está determinada sobre todo por diferenciales interregionales en las oportunidades laborales. Lo que está menos claro es el papel de las prestaciones regionales a la hora de atraer mano de obra altamente cualificada.

Keywords:
Elección del destino
Asignación espacial del capital humano
Convergencia

JEL classification: R23, J61, C35

1. Introduction

This paper examines the skill composition of migration flows in Germany by looking at the destination choices of different skill groups. Understanding what attracts skilled migrants to a particular region is of high policy interest because the local availability of a large pool of qualified workers has been considered to facilitate innovative activities and to improve the endogenous growth potential of the region (Lucas, 1988; Romer, 1990). Rauch (1993) and Simon (1998) empirically confirm the positive linkage between the initial human capital endowment of a region and its future economic growth. As a consequence of such skill externalities, the inward migration of skilled individuals may foster a self-reinforcing regional economic growth that intensifies regional economic disparities (Nijkamp and Poot, 1997). In the German context, several recent studies suggest that net migration from eastern to western Germany is disproportionately high-skilled (Schwarze, 1996; Hunt, 2000; Burda and Hunt, 2001). This raises strong concerns that a brain drain from eastern to western Germany may reinforce east-west disparities in employment and wages. The aim of this paper is therefore to identify major determinants of the skill composition of migration flows in Germany. By doing so, the paper provides insights on how policy can promote convergence, a topic that is of high relevance in Germany, as well as in a broader European context.

Similar to a recent US study by Hunt and Mueller (2004), the paper considers a number of pecuniary and non-pecuniary forces behind the skill composition of internal migration in Germany. This approach fills an important research gap in the European context because European studies on the skill composition of internal migration flows - to the best of my knowledge - exist for Finland only and indicate that high-skilled individuals tend to relocate to high-density urban areas (Ritsilä and Ovaskainen, 2001; Ritsilä and Haapanen, 2003). Whether this is due to a mixture of a higher urban wage premium, job opportunities or consumer amenities, however, remains an unresolved question. This

study sheds some light on this question in the German context. For this purpose, I use a partially degenerate two-level nested logit model to examine the relevance of both pecuniary and non-pecuniary regional disparities for the spatial pattern of job moves in Germany.[1]

Furthermore, the paper extends previous studies by examining differences in destination choices not only by skill level, but also by the type of job match. This may be important if some of the differences by skill level are actually driven by different destination choices of job-to-job movers and job movers after unemployment. As another contribution to the literature, the econometric approach of this paper takes account of unobserved interregional heterogeneity. To the extent that amenity valuations differ by skill level, unobserved interregional amenity differentials may bias the impact of observed interregional income differentials that tend to compensate for amenity differentials. See Hunt (1993) and Elhorst (2003) for a discussion. While previous papers have addressed this problem by including amenity indicators such as regional climate differentials (Hunt and Mueller, 2004), this paper includes destination fixed effects to reduce remaining biases (Train, 2002).

Estimation results show some major differences in the spatial pattern of job matches by skill level. In a model with destination fixed effects, the spatial pattern of job matches by high-skilled individuals is mainly driven by interregional income differentials, while job matches by less-skilled individuals are mainly affected by regional differentials in job opportunities. Interregional differences in wage dispersion as well as amenity differentials only weakly contribute to spatial sorting processes in Germany which are partly driven by different destination choices of job-to-job movers and job movers after unemployment.

2. A theoretical underpinning of skill sorting across space

As an extension to the seminal paper by Borjas et al. (1992) on the income-maximising choice of destinations, Hunt and Mueller (2004) have recently modelled destination choices as a utility-maximising behaviour. This approach stresses the role of non-pecuniary returns from moving to a particular region. Following their approach, this paper assumes that movements between *K* regions are based on utility maximisation. Consider the net present value of the expected lifetime indirect utility of living and working in *k* if individual *i* originates from *o*, V_{iok}, to depend on individual *i* 's preferences for certain region-specific attributes, his employment and wage prospects in region *k* and the cost of relocating from *o* to *k*

$$V_{iok} = \frac{1}{r}\left[\alpha_{ik} \int_{w_i^r}^{w^{\max}} w_i dF_k(w) + (1-\alpha_{ik})b_k + a_{ik}\right] - C_{iok}, \qquad (1)$$

with *r* as the discount rate. There are several reasons why a utility-maximising behaviour of this net present value induces a sorting of skill groups across space.

First of all, α_{ik} summarises the chances of individual *i* to find and keep an acceptable job in region *k*. This probability depends on the demand for the occupation and skill level of individual *i* in region *k* and the willingness to accept job offers, i.e. the reservation wage w_i^r. (1- α_{ik}) thus denotes the individual-specific probability of future periods without any wage income but a real transfer income b_k instead that may differ across space due to regional cost-of-living differences. In case of employment, the expected real wage for individual *i* is given by $\int_{w_i^r}^{w^{\max}} w_i dF_k(w)$ which depends on the moments of the wage distribution $F_k(w)$ in region *k*. While a variance-preserving increase in the mean wage level should attract individuals irrespective of skill level, a change in the wage dispersion may induce skill sorting. According to the extended Roy selection model (Roy, 1951; Borjas, 1987; Borjas et al., 1992), migrants maximise their income by choosing a destination region that provides the most favourable income distribution. In

particular, conditional on the mean wage, a high-skilled individual who is likely to draw wage offers from the upper quantile of the wage distribution has a higher expected wage in regions where the wage dispersion is large.[2] It follows that high-skilled individuals have incentives to move to regions that reward their human capital investments, whereas less-skilled individuals reduce the penalty attached to the lack of these skills by moving to regions with less income inequality.

In addition to these pecuniary factors, a_{ik} captures the value of non-pecuniary benefits or costs that arise from living in region *k*. In particular, every location offers a set of natural (e.g. climate), consumer (e.g. the variety of consumption goods and activities) and public goods amenities (e.g. school quality, infrastructure), but also comes with disamenities (e.g. lack of housing space, pollution, crime rates). Recent research suggests that high-income or educated individuals tend to consume a disproportionate share of consumer amenities and may thus prefer amenity-rich regions due to higher amenity valuations (Brueckner et al., 1999; Glaeser et al., 2001).

Finally, the costs of moving to region *k*, C_{iok}, may be negatively related to human capital (Chiswick, 2000; Brücker and Trübswetter, 2004). This may be a reasonable assumption if high-skilled individuals have access to geographically broader social networks that reduce the information or psychological costs associated with migration. As a consequence, the skill level of internal migration flows might increase with migration distance.

One important insight of this framework is that the proportion of high-skilled individuals moving to *k* may be affected by skill-specific employment opportunities, the level of amenities, the degree of wage inequality and the migration costs involved in moving to region *k*. In line with these predictions, Hunt and Mueller (2004) find evidence in favour of higher amenity valuations among high-skilled migrants in the US and Canada. Based on a nested logit model of destination choice, their findings also confirm lower

migration costs for high-skilled migrants and the implication of the Roy model that high-skilled individuals tend to move to regions with a high skill premium.

The objective of this paper is to test these predictions in a German context. As an extension, the paper suggests that the skill composition of migration flows may be partially explained by different destination choices of job-to-job movers and job movers after unemployment since the proportion of job-to-job movers varies across skill groups. For one thing, a large share of job-to-job movers is likely to be non-searchers who receive job offers through career networks and professional contacts without actually looking for jobs (McDonald and Elder, 2006). For such informal job search, local labour demand conditions need not be important for finding a job in a particular region. By contrast, unemployed job movers are less likely to have access to such networks and may rely more on formal job search via employment agencies or the internet, in which case the local labour demand situation should be rather important. Secondly, job search theory predicts that the acceptable wage offer w_i^r in (1) is higher for on-the-job searchers than for otherwise identical unemployed job searchers.[3] For this reason, job-to-job movers are likely to prefer destinations with higher wage levels or otherwise attractive compensating conditions such as high amenities. The following empirical analysis thus examines destination choices not only by skill level but also by type of job move in order to shed some light on what determines the skill composition of migration flows and thus the allocation of human capital across space.

3. Data

The analysis is based on the IAB-R01, the IAB employment subsample 1975-2001 - regional file, an administrative data set that is available from the Institute of Employment Research (IAB) of the Federal Employment Agency (Hamann et al., 2004). This register data set contains information on a 2 % sample of the population working in jobs that are

subject to social insurance payments, thus excluding civil servants and self-employed individuals. More specifically, the data consists of employment spells, i.e. daily information concerning the beginning and end of employment periods that are covered by the social security system. As a supplement, the data includes spell information on periods for which the individual receives unemployment compensation from the Federal Employment Agency. We can thus reconstruct employment histories including periods of transfer receipt on a daily basis.

Moreover, the IAB-R01 allows for comparing the microcensus region of the previous and the current workplace in order to identify interregional mobility. As the basis for distinguishing between intraregional and interregional mobility, I group the microcensus regions to 27 aggregated planning districts. The 97 original planning districts ("Raumordnungsregionen") in Germany are defined according to commuting ranges and thus comprise labour market regions that are relatively self-contained. Since due to the resulting sample size, using 97 regions for the destination choice model was not computable, I reduced the number of destinations by aggregating planning districts according to an algorithm that reduces the remaining external commuting linkages.[4,5] Based on the resulting regional classification (see Figure 1), I define the origin and destination region of each job move.

A job move in the IAB-R01 occurs if there has been a change in an establishment identifier from one to the next employment spell and the reason for ending the previous spell of employment is denoted as "end of employment".[6] Moreover, a job move is assumed without a change in the establishment identifier if the gap between two employment spells exceeds 120 days. This restriction ensures that recalls linked to seasonal work are for the most part not counted as job moves.

< Figure 1 to be displayed here >

The IAB-R01 does not allow for distinguishing between those who have left the labour force and those who are still unemployed without receiving unemployment compensation.[7] I thus distinguish between job-to-job moves and job moves after unemployment according to the following definitions

1. Job-to-job move (JJC): The job move occurs within 90 days after the last job ended and there has been no intermediate transfer receipt.

2. Job move after unemployment (UJC): A UJC occurs if there has been a preceding transfer receipt that terminated less than 90 days before the start of employment. Gaps between previous periods of transfer receipt are no longer than four weeks and transfer receipt started within four weeks after the last spell of employment ended. Since a voluntary job quit entails a suspension of unemployment compensation of at least four weeks, this last restriction ensures that UJC mostly excludes voluntary unemployment.

3. Job move after all other states (REST): REST comprises (1) Job moves without any intermediate transfer receipt but a gap of more than 90 days between both spells of employment. (2) Job moves with intermediate transfer receipts that do not fulfil the UJC definition due to longer gaps before, during or after transfer receipt.

For the subsequent analysis, I use only JJC and UJC since REST is a very heterogeneous sample for whom the intermediate labour market status and thus also the intermediate whereabouts are unclear. Furthermore, I restrict the sample to job moves between 1995 and 2001 since prior to 1995 there have been dramatic changes in the demarcation of eastern regions that complicate any regional analysis.

In order to receive a relatively homogeneous sample, I further restrict the sample to prime-age males aged 25 to 45 years who are reported full-time employed by their employers. Despite a growing literature regarding the substantial east-west migration of women in Germany (Kröhnert et al., 2006), I exclude women because the IAB-R01 does not include information on marital status or dependent children. Although such missing

information also introduces unobserved heterogeneity in the male sample, numerous studies suggest that the relevance of this unobserved heterogeneity should be more severe for women because labour supply behaviour depends much more on the marital status and the presence of dependent children than for men (see Killingsworth and Heckman, 1986, for a formal discussion). The missing household information thus complicates the interpretation of female estimates. For this reason, I restrict the analysis in this paper to men only.[8] These data-driven sample selections should be borne in mind since the empirical findings may not be applicable to excluded labour market segments.

For the analysis, I distinguish between high-skilled job movers with a tertiary education and less-skilled individuals who are either unskilled or have a vocational training. Based on these definitions, the sample comprises 117,106 JJC and 85,177 UJC by 26,477 high-skilled and 175,806 less-skilled observations in the period from 1995 to 2001.[9]

4. Background and descriptive evidence

Figure 2 shows average economic conditions in the aggregated planning districts between 1995 and 2001. Eastern Germany clearly lags behind economically with unemployment rates around twice the average rate of the western regions. Moreover, eastern wages continue to be one-quarter below the western wage level despite a remarkable wage convergence during the 1990s. Wage dispersion continues to be less pronounced in the eastern than in the western regions despite growing wage inequality in eastern Germany since the 1990s. According to the Roy selection model, this should contribute to a positive selection of east-west migrants. In addition to the east-west disparities, Figure 2 also indicates some heterogeneity among the western regions. The lowest unemployment rates, highest employment growth and highest wage levels tend to be found in the southern parts of western Germany.

< Figure 2 to be displayed here >

Figure 3 looks at the employment change by skill level that is induced by net migration flows. Apparently, both eastern as well as some selective western regions, especially in the northern part of western Germany, experience net losses of human capital. In line with Büchel et al. (2002), the descriptive evidence thus points towards a continued brain drain from eastern to western Germany. Moreover, the east not only looses high-skilled migrants mainly to the southern parts of western Germany, but also experiences an even larger net loss of less-skilled migrants. The employment change induced by net migration from eastern to western Germany amounts to 1.2% of high-skilled, and 1.4% of less-skilled employment at the beginning of the observation period. By contrast, the middle and especially the southern parts of western Germany have positive net flows for both skill groups. The job flows thus mainly indicate a re-allocation of population and high-skilled labour from the east to the southern parts of western Germany. The following econometric analysis examines to what extent heterogeneous destination choices drive these observed sorting processes.

< Figure 3 to be displayed here >

5. A partially degenerate nested logit model

Following the random utility approach to discrete choice problems (McFadden, 1981), the probability that individual *i* with origin *o* prefers destination *j* over alternative destinations *k* is

$$P_{ioj} = P\left[V_{ioj} + \varepsilon_{ioj} > V_{iok} + \varepsilon_{iok}\right] \quad \forall j \neq k \qquad (2)$$

with V_{iol} denoting the observed utility for individual *i* of moving to region *l = j,k* as given in (1). ε_{iol} is the unknown stochastic part. Assuming independent, identically extreme value distributed error terms between all regions yields the logit specification which has been used by a number of recent destination choice studies (Davies et al., 2001; Schündeln, 2002), but may be inappropriate if choices are related due to unobserved utility components. In order to allow for some correlation among non-origin regions, I thus use a partially degenerate nested logit model, as discussed in Hunt (2000) that distinguishes between two upper-level branches: staying in the local area (*s*) and migrating (*m*). At the lower-level, the degenerate branch *s* contains the origin region as the only choice, while branch m distinguishes between all non-origin regions and assumes Independence of Irrelevant Alternatives (IIA). The nested logit model can be decomposed into two probabilities. The conditional probability for the non-degenerate branch *m* can be written as

$$P_{ioj|m} = \frac{\exp(\gamma_1' z_{ioj} + \gamma_2' d_j)}{\sum_{k \in m} \exp(\gamma_1' z_{iok} + \gamma_2' d_k)} \quad , \qquad (3)$$

while $P_{ioo|s} = 1$ for the degenerate branch. γ_1 *and* γ_2 denote parameter vectors. Since the observed job moves occur between 1995 and 2001, the covariates specific to a certain destination path for individual *i* z_{iok} always correspond to the year in which the job move takes place. Thus, z_{iok} vary across observations depending not only on an individual's origin region but also on the year in which the job move takes place. This introduces some temporal variation in the data that allows for an introduction of destination-specific fixed effects d_k in (3) in order to avoid biases from omitting time-invariant regional characteristics. In addition, the covariates z_{iok} are defined as differences between the standardised values for the destination and the origin region, i.e. $z_{iok} = \tilde{z}_{ik} - \tilde{z}_{io}$. This reflects the notion that destination choices are typically made by comparing potential destinations with the current region of residence. As a drawback, however, this imposes

the restriction that responses to changes in the origin or the destination region are symmetric.[x]

The marginal probability of migrating can be written as follows:

$$P_{iom} = \frac{\exp(\alpha_m' x_i + \beta_m' h_o + \xi_m iv_{iom})}{1 + \exp(\alpha_m' x_i + \beta_m' h_o + \xi_m iv_{iom})} \quad , \quad (4)$$

with

$$iv_{iom} = \ln\left[\sum_{k \in m} \exp(\gamma_1' z_{iok} + \gamma_2' d_k)\right] \quad . \quad (5)$$

The parameter vector α_m measures the effect of individual characteristics x_i and β_m the effect of origin-specific fixed effects h_o on the probability of migration. iv_{iom} refers to the inclusive value which links the upper with the lower model. In particular, $\xi_m iv_{iom}$ may be interpreted as the expected utility individual i derives from migrating to one of the non-origin regions. Moreover, the inclusive value parameter ξ_m reflects the degree of independence among all non-origin regions. Since $\xi_m = 1$ has been rejected for all subsequent estimations, the choices cannot be considered fully independent so that the nested logit model turns out to be an appropriate specification. I estimate a non-normalised nested logit (NNNL) which is consistent with utility maximising behaviour only if no coefficients are common across branches and ξ_m lies within the interval [0; 1] (Koppelman and Wen, 1998; Hensher and Greene, 2002). Both of these conditions are fulfilled in the subsequent estimations.

I estimate the NNNL sequentially by estimating the lower level model and the inclusive value before estimating the upper level model. This sequential estimation is less efficient than simultaneous estimation by full information maximum likelihood (FIML). Moreover, the standard errors of the upper level model may be biased downward (Amemiya, 1978). Since FIML was computationally infeasible for the complete sample and the main focus of

the paper is on lower level estimates for which both point estimates and standard errors are consistent, I decided to use the sequential estimation method. When comparing sequential estimates with FIML estimates for some smaller sub-samples, both point estimates and standard errors for upper level covariates were quite similar. This suggests that the sequential estimation bias may be negligible. For all estimations, I further impose standard errors that are robust to clustering at the regional level in order to avoid downward biased standard errors (Moulton, 1990).

Upper level covariates x_i consist of individual-level characteristics such as age, previous job status, previous sector of activity, previous type of occupation and wage income in the job prior to the job move that may affect individual mobility decisions. Unfortunately, the IAB-R01 does not include important characteristics such as home ownership and marital status which have been shown to affect the propensity to be mobile. Instead, the data set allows for capturing the individual employment history (e.g. previous average tenure, previous recalls, duration of previous non-employment periods) which should at least reduce some of the unobserved heterogeneity among individuals. I also include an indicator for individuals of East German origin to capture differences in the propensities to be mobile. Moreover, since individuals may experience more than one job move during the observation period, an additional indicator for multiple job moves controls for major differences between multiple job movers and individuals with only one job move. In addition, x_i includes dummies for the year in which the job move occurs. Moreover, (3) includes origin dummies h_o to capture differences in the propensity to be mobile across origin regions. Appendix C contains summary statistics for all upper level covariates.

Lower level covariates z_{iok} are intended to capture observed utility differences between alternative destinations as suggested by the theoretical framework. As an indicator of regional job-finding conditions for individual *i*, I use the regional unemployment rate,

regional employment growth in individual *i* 's skill group and the share of high-skilled employed in region *k*.[xi] While the unemployment rate indicates general job-finding conditions, higher employment growth in individual *i* 's skill group indicates improving employment prospects. Moreover, a region with a high level of qualified jobs may offer favourable job-finding conditions for high-skilled job movers. z_{ik} also includes the median wage in individual *i* 's sector of activity as an indicator of interregional differences in the wage level and the ratio between the 80th and 20th wage percentile in region *k* as an indicator of regional wage inequality.[xii,xiii] For non-pecuniary regional differences, only few relevant indicators are available for the study period. As suggested by Herzog and Schlottmann (1993), I include population levels as a proxy for urban-scale related consumer amenities. Moreover, I use the population density as a measure of agglomeration effects as suggested by Ciccone and Hall (1996)[xiv]. While urban-scale related amenities should be attractive for migrants, especially high-skilled ones, a denser agglomeration for a given urban scale may also capture disamenities such as pollution or lack of housing space.[xv] In addition, I use hotel capacities per resident as a proxy for the general attractiveness of the region as proposed by Glaeser et al. (2001). Moreover, I include regional child care facilities as an indicator of the availability of a specific type of public goods. As a specific source of disutility, I include regional crime rates. Regional land price differentials are used as a rough proxy for interregional cost of living differentials. In addition, the model includes the distance between origin and destination region as a measure of migration costs that may be related to distance such as psychological costs. Moreover, since some covariates such as employment growth and population size may be endogenous due to a simultaneity issue, I use the values in the period prior to the job move for all covariates z_{iok} for which a simultaneity issue is likely to arise (see Appendix A).

In addition to destination-specific fixed effects, the specification includes fixed effects for movements across the former inter-German border and for movements

between northern and southern Germany in order to capture unobserved factors such as the psychological or cultural proximity between these regions. Appendix A lists the exact definitions and data sources of all lower-level variables, while Appendix B gives the corresponding summary statistics. Including lagged covariates, regional fixed effects for destination regions and fixed effects for some major migration path should reduce potential biases compared to earlier studies that do not consider any fixed effects such as Hunt and Mueller (2004).

Marginal effects of an increase in the difference between origin and destination region z_{iok} by one standard deviation on the lower level probability of moving to region k have been computed as

$$\frac{\partial P_{iok|m}}{\partial z_{iok}} = \gamma_z P_{iok|m}(1 - P_{iok|m}) \qquad (6)$$

for continuous covariates, and as $\Delta P_{iok|m} / \Delta z_{iok} = P_{iok|m,z_{iok}=1} - P_{iok|m,z_{iok}=0}$ for dummy variables. The marginal effects of a change in w_i on the marginal probability of leaving the local region are given as

$$\frac{\partial P_{iom}}{\partial w_i} = \beta_w P_{iom}(1 - P_{iom}) \qquad (7)$$

for continuous covariates and as $\Delta P_{iom} / \Delta w_i = P_{iom|w_i=1} - P_{iom|w_i=0}$ for dummy variables. For both lower and upper level marginal effects, the delta method has been applied to calculate standard errors. Marginal effects and standard errors shown in the subsequent tables always refer to the average effects in the sample population (Train, 2002).

6. Estimation Results

Lower level estimates. Table 1 shows estimated marginal effects on the conditional probability of moving to destination *k* by skill level for the pooled sample of all job moves. Specification A includes neither destination-specific fixed effects nor dummy variables for specific migration paths while specification B includes these additional covariates. Comparing both specifications in Table 1 suggests that including a number of regional amenity indicators in specification A does not suffice to prevent biases from unobserved time-invariant interregional amenity variations. In particular, the effect of the wage level seems to be downward biased while the impact of the unemployment rate is upward biased. These biases are consistent with the notion that higher local amenities compensate for lower wages and higher unemployment rates. In this case, the interregional wage differential is negatively related to the unobserved interregional amenity differential, while the unemployment differential should be positively related to the amenity differential (Elhorst, 2003). Moreover, amenity indicators also seem to be biased due to unobserved region-specific factors. As an example, specification A suggests that higher crime rates attract individuals, while no such evidence can be found for specification B. Specification B also seems to be more reliable than specification A when it comes to testing the Independence of Irrelevant Alternatives assumption by running a Small-Hsiao test for successively excluding each of the 27 regions.[xvi] Table 1 shows that the IIA assumption is not rejected for any region with model B. This is some evidence that the nested logit model is well specified.[xvii] In order to examine whether the type of job move matters for destination choices, Table 2 thus displays estimation results by skill level and type of job move for specification B only.

< Table 1 to be displayed here >

Economic conditions. As expected, interregional job movers tend to move to regions with higher wage levels. Interestingly though, the last column in Table 1 suggests that this effect is significantly stronger at a 5% significance level for high-skilled than for less-skilled interregional job movers. While for less-skilled individuals a one standard deviation increase in the sector wage level in region *k* increases the probability of moving to *k* by only 0.5*pp*, the corresponding effect for their high-skilled counterparts is four times as large, which may reflect higher labour supply elasticities among high-skilled individuals. Furthermore, consistent with the theoretical notion in section 2 that income prospects may be more important for career-oriented job-to-job moves than for job moves after unemployment, point estimates in Table 2 suggest that the wage level is a more important determinant of destination choices for job-to-job movers than for job movers after unemployment. Differences between the two types of job movers are not significant though.

There is no significant evidence in Table 1 that high-skilled job movers prefer regions with high wage inequality, while there is significant evidence that their less-skilled counterparts avoid such regions. Controlling for the type of job move in Table 2 does not alter this result. Consistent with the extended Roy model, this finding may thus suggest some weak skill sorting based on interregional differences in wage inequality. Compared to the U.S. study by Hunt and Mueller (2004), however, the impact of wage inequality is relatively weak. This may be because, with the exception of east-west disparities, interregional differences in wage dispersion are much smaller in Germany than in the US due to the fact that central wage bargaining leaves less room for regionally tailored wage agreements. Thus, in Germany, the effect of wage dispersion is more difficult to identify and thus only differences in wage level appear to have a strong impact on both the level and skill composition of interregional migration flows.

The skill composition of interregional job flows is also affected by interregional differences in employment opportunities. Table 2 shows that irrespective of the type of job

move there is significant evidence that less-skilled individuals tend to move to regions with low unemployment rates, while no significant evidence can be found for their high-skilled counterparts. This contradicts the notion from section 2 that direct job movers are more likely to make use of interregional career networks than unemployed job seekers. Instead, the findings rather suggest that high-skilled job movers are more likely to make use of interregional career networks than their less-skilled counterparts irrespective of the type of job move. If less-skilled job movers have less interregional personal contacts, they may rely more on formal job search for which the competition from other searchers, and thus the labour market tightness as reflected in unemployment levels may be particularly important.

We can conclude that interregional economic differences affect the skill composition of interregional job flows for two main reasons. Firstly, higher wage levels disproportionately attract high-skilled migrants, especially high-skilled job-to-job movers, whereas interregional differences in wage dispersion contribute only weakly to skill sorting across space. Secondly, unemployment differentials only exert a strong and significant effect on less-skilled job movers.

< Table 2 to be displayed here >

Amenities and rents. Compared to the impact of interregional income and job-finding differentials, amenity differentials as captured by the previously discussed proxies do not seem to have a strong impact on destination choices according to specification B in Table 1. As regards different preferences for amenities between skill groups, parameter estimates for specification B in Table 1 do not contradict the idea that high-skilled individuals may have higher amenity valuations, but also do not present strong evidence in favour of this notion. Point estimates for the urban scale effect of higher population

levels, for example, are indicative for higher valuations of consumer amenities among high-skilled job movers. Moreover, the availability of child care facilities as a specific type of public good significantly attracts only high-skilled job movers (+0.6pp). Table 2 suggests, however, that the already weak evidence in favour of higher amenity valuation among high-skilled movers vanishes when controlling for the type of job move. In particular, although differences between JJC and UJC are not statistically significant, Table 2 indicates that it is rather higher amenity valuations by the relatively well-educated JJC compared to the less-educated UJC that results in the observed skill sorting across space in Table 1. Additional indicators either do not significantly affect destination choices (e.g. crime rates) or leave the skill composition mainly unaffected (e.g. population density).

To some extent, these rather weak findings regarding the impact of amenities may result from region-specific fixed effects soaking up interregional amenity differentials because such differentials are relatively stable across the relevant 7-year observation period. Thus, while specification B should give a less biased picture than specification A, it should also yield a rather conservative picture regarding the relevance of amenity differentials in destination choices. It may thus be worthwhile to take a closer look at the marginal effects of the destination dummies which reflect the average unobserved attractiveness of a region as a destination for interregional job movers. Appendix D includes maps of these marginal effects for both skill groups. In order to examine the factors behind these interregional differentials, it is interesting to regress these marginal effects on some time-constant regional characteristics to assess their impact on the probability of moving to region *k* for different skill-groups:

$$MARG_k = \alpha_1 + \alpha_2 HS_k + \alpha_3 R_k + \alpha_4 HS_k x\ R_k + \varepsilon_k \qquad (8)$$

where $Marg_k$ with $k = 1,\ldots,54$ denotes the destination-specific marginal effects (including the reference destination with a marginal effect of zero) for both high- and less-skilled

individuals from estimation B in Table 1.[xviii,xix] HS is a dummy variable that indicates whether a marginal effect has been estimated for the high-skilled or less-skilled sample of job movers. R_k contains a set of region-specific explanatory variables and *R x HS* contains the respective interactions. Since OLS standard errors may be subject to a small sample bias (N = 54), I report the heteroscedasticity-robust standard errors based on a jackknife procedure.[xx] The set of destination-specific explanatory variables includes the population density, the gross domestic product, the share of employees in services as well as two climate indicators (average temperatures in July and January). All these indicators are either time-constant for the relevant observation period (climate) or are calculated as the average across the seven year observation period. They thus capture average differences across regions that may be related to the unobserved interregional differential in the attractiveness of destination regions as reflected in the marginal effect. Interregional differences in the gross domestic product per head, for example, should be positively correlated with unobservable interregional cost-of-living differentials. Moreover, regions with higher average population densities and higher average shares of jobs in services across the 7-year period are likely to be amenity-rich regions with regard to consumer amenities. In addition, climate-related characteristics have been found to significantly affect interregional migration in the US, especially among high-skilled individuals (Hunt and Mueller, 2004). Although interregional climate differences are less strong in Germany, I include them to test for their relevance in the German context.

All continuous variables in Table 3 have been standardised. As a first finding, note that a higher population density and a higher share of service jobs are associated with a higher probability of moving to this region. Moreover, these relationships are significantly stronger for high-skilled job movers. To the extent that these indicators proxy for consumer amenities, this indicates the relevance of such factors in destination choices, especially among high-skilled migrants. Note also that regions with a higher GDP per head have lower probabilities of being destination regions. Since GDP per head should be

positively correlated to unobserved regional costs of living, this finding may suggest that job movers avoid expensive places for living. Similar to the findings from Hunt and Mueller (2004), climatic characteristics seem to be more important for high-skilled than for less-skilled job movers. A higher average temperature in July, for example, is related to a significantly higher probability of high-skilled inward migration. Although these results should not be considered to give any causal relationship since there may be biases from omitting important regional characteristics, Table 3 still provides some evidence that amenity valuations differ more across skill-groups than suggested by estimates in Tables 1 and 2.

< Table 3 to be displayed here >

Migration cost. Consistent with the theoretical framework, Tables 1 and 2 show that the likelihood of moving to a region significantly decreases with distance for all skill levels and that costs associated with migration distance tend to be higher for less-skilled than for high-skilled job movers. In order to keep the probability of moving to region *k* constant if migration distance marginally increases from 100 to 101 km, the hourly wage level in *k* has to be 0.02 euros higher for high-skilled and 0.12 euros higher for less-skilled individuals.[xxi] Based on the point estimates, the proportion of high-skilled following a particular migration path would thus increase with distance. According to Table 2, this finding is robust if the type of job move is controlled for.

Interestingly, moving to eastern Germany seems to be associated with a strong and significant disutility for individuals born in West Germany while there is no additional utility assigned to the opposite direction for former East Germans. These additional costs of crossing the former border are likely to reflect some reluctance on the part of West Germans to move to eastern Germany that is not explicable by observed regional disparities. Such reluctance has also been found by Büchel et al. (2002) in a study of

migration intentions among West Germans. According to this study, only one third of those who are willing to change residential location are also willing to move to eastern Germany while more than 50% are willing to leave the country. Thus, at least for individuals born in West Germany, the former border still seems to exist in their minds.

Upper level estimates. Table 4 shows marginal effects on the probability of leaving the local region, i.e. the probability of experiencing an interregional instead of an intraregional job move. The specification comprises the inclusive value estimate $i\hat{v}_{im}$ from the lower level specification B which reflects the expected utility that an individual derives from migration. The corresponding parameter estimate ξ_m indicates whether pull factors are important in determining mobility decisions. According to a test of equal parameters across sub-groups, high-skilled job-to-job movers are significantly more responsive to pull factors than other sub-groups. As a consequence, the share of interregional movers who are high-skilled slightly increases if other labour markets gain in attractiveness. Apart from the inclusive value, there are a number of additional upper level covariates that significantly affect the decision to change a job interregionally. Across all sub-groups, younger, better skilled and previously well-earning job movers are more likely to migrate. Previous recalls dramatically reduce the likelihood of migration because these individuals tend to be recalled locally again and may simply not look for jobs elsewhere. Longer average tenure also reduces the probability of leaving the local region, probably due to the regional attachment that comes with long job tenure. Furthermore, migration levels increased during the observation period from 1995 to 2001. This is in line with Heiland (2004) who finds that increasing migration levels coincided with a period of stagnation in eastern Germany in the mid to late 1990s. Finally, the estimates suggest a much higher probability of changing a job interregionally for less-skilled East Germans as compared to West Germans. This may mainly reflect unfavourable employment conditions that force

especially less-skilled individuals in eastern Germany to look for jobs in alternative locations.

< Table 4 to be displayed here >

7. Conclusion

This paper has identified some determinants of the skill composition of internal job flows in Germany by looking at destination choices of heterogeneous job movers. Since regional economic prospects critically hinge on the skill composition of internal migration flows, the analysis thus provides some insights into how policy may contribute to regional convergence. Such insights are of particular value in light of the continued brain drain from eastern to western Germany. As an extension to previous studies, this study has examined whether different destination choice patterns of job-to job movers and job movers after unemployment contribute to skill-sorting across space. Moreover, the analysis takes account of unobserved regional heterogeneity which proved important to reduce biases arising from the omission of unobserved regional characteristics. Using a partially degenerate nested logit analysis, this paper comes to the following main conclusions:

- Interregional income differentials affect the skill composition of job flows because high-skilled job movers are more responsive to interregional variation in the wage level than their less-skilled counterparts. By contrast, compared to the US findings by Hunt and Mueller (2004), wage inequality only weakly contributes to skill sorting. This may reflect that central wage bargaining in Germany leaves little scope for local wage agreements.
- Interregional unemployment differentials only exert a significant effect on the migration behaviour of less-skilled job seekers.

- Higher amenity valuations of job-to-job movers compared to job movers after unemployment seem to contribute weakly to skill sorting across space. However, effects of amenity differentials may partly be captured by destination-specific fixed effects. Regressing the corresponding marginal effects on some time-constant interregional differences suggests that amenity differentials may induce stronger skill sorting than suggested by the observable amenity indicators in the nested logit analysis.
- High-skilled job movers seem to face lower migration costs so that the proportion of high-skilled migrants strongly increases with migration distance.
- High-skilled job-to-job movers are more responsive to pull factors than all other subgroups. Improving destination conditions thus disproportionately mobilise this group which affects the skill composition of interregional job flows.

These findings imply that it is mainly economic conditions that drive the skill composition of job flows in Germany, although amenity differentials may also contribute to the re-allocation of human capital. Currently, eastern wages are still a quarter below the western wage level and unemployment rates are almost twice as high as in western Germany while differences in observable amenity indicators are small or even to the advantage of the eastern regions. A policy approach to attract human capital to eastern Germany should thus focus on economic conditions and create productivity-enhancing conditions that, at the same time, allow for increasing wages and stable or falling unemployment rates.

Due to data limitations, these results are based on a sample of prime age male job movers only. Thus, extending the analysis to endogenously model the job mobility decision would allow for examining how certain labour market conditions may induce or retard job mobility and may affect the composition of job moves and the resulting spatial patterns of job matches. Moreover, data limitations that stem from missing information such as the marital status and the tenant status of the job mover point to the need of

reinvestigating the results when better data become available. As a methodological extension, the spatial character of choosing a destination may be incorporated more explicitly into the destination choice model by allowing for more general spatial substitution patterns as discussed by Hunt et al. (2004). In addition, research about destination choices in Germany should be extended to single females and first time job entrants such as university graduates. These groups have recently experienced the highest rates of east-west migration. In addition to skill sorting, the sorting by age and sex thus comes to the spotlight of research interests as the lack of young individuals and especially young females already poses severe problems to the viability of certain regions in eastern Germany.

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Appendix

A – Definition and data sources of lower-level covariates

Variable	Definition	1 yr Lag	Source[a]
Covariates with area and individual variation			
Median sector wage	Median wage in i's sector of activity l (l = 1..13)	No	A
Sector employment	Biennial employment growth in i's skill group	Yes	B
Covariates with area variation			
Wage variance index	Regional wage percentile ratio (80/20) divided by aggregate percentile ratio (80/20)	No	A
Unemployment rate	Average yearly unemployment rate	Yes	C
Skill level	Share of high-skilled employees	Yes	B
Log (Distance)	Log of average distance between all county capitals of any two regions	-	D
Population size	Number of residents in 100,000	Yes	E
Population density	Number of residents (in 100) per km^2	Yes	E
Crime Rate	Total offences per 100 residents	No	F
Hotel capacity	Number of hotel beds per 1000 residents	No	E
Child care facilities	Places in day care for children per 1,000 residents	No	E
Land prices	Land prices in 100 Euros per m^2	No	E

a A - Own calculation based on the IAB-R01 1995-2001 and the methodology proposed by Hunt and Mueller (2002).
B - Own calculation based on IAB-R01 1993-2001.
C - Federal Employment Agency („Bundesagentur für Arbeit")
D - Own calculations based on the grid position of county capitals.
E - Federal Statistical Office ("Statistisches Bundesamt")
F - European Regional Crime Database, Entorf and Spengler (2004)

b I distinguish between employment growth for high-skilled individuals with a tertiary education and less-skilled individuals.

B – Sample averages for lower level covariates by sub-sample

	JJC		UJC	
Covariates	LS	HS	LS	HS
Median sector wage	0.104	0.055	0.139	0.110
Wage variance index	0.066	0.013	0.085	0.034
Unemployment rate	-0.114	-0.057	-0.146	-0.137
Employment growth	0.026	0.028	0.038	0.043
Skill level	-0.009	0.028	-0.009	0.125
Log(Distance)	5.163	5.307	5.209	5.276
Population size	0.012	0.014	0.022	0.050
Population density	0.014	0.003	0.041	0.032
Crime Rate	-0.051	-0.020	-0.066	-0.060
Hotel capacity	0.010	0.002	-0.019	0.012
Child care facilities	-0.048	0.006	-0.062	-0.050
Land prices	0.094	0.071	0.122	0.205
# of interregional moves	19,927	8,092	11,573	2,137

Notes:

Except for log(distance), all covariates refer to the difference between the standardised value for the destination (d) and the origin (o) region. Thus a value of 1 indicates a difference of one standard deviation between d and o. JJC - Job-to-job mover; UJC - Job movers after unemployment; LS - Less-skilled; HS - High-skilled

C – Sample averages for upper level covariates by sub-sample[a]

	JJC		UJC	
Covariates	LS	HS	LS	HS
Migrant	0.21	0.38	0.15	0.39
Age (Reference: Age 35-40)				
25-30	0.29	0.15	0.27	0.13
30-35	0.29	0.37	0.27	0.32
40-45	0.19	0.20	0.22	0.26
Wage quintile in previous job[b] (Reference: 1st wage quintile)				
2nd	0.25	0.08	0.31	0.18
3rd	0.16	0.09	0.17	0.15
4th	0.10	0.19	0.07	0.17
5th	0.07	0.39	0.02	0.19
Employment history and other covariates				
Born in East Germany	0.21	0.13	0.33	0.22
Multiple job moves[c]	0.68	0.62	0.80	0.67
Prev. average tenure (yrs.)	2.91	2.44	1.74	1.76
Months prev. non-employed	1.04	0.76	2.24	1.97
Prev. recall by employer	0.01	0.01	0.18	0.03
Previous sector of activity (Reference: Agriculture and Fishing)				
Primary industry	0.06	0.05	0.06	0.04
Invest. goods/engineering	0.08	0.08	0.05	0.07
Invest. goods/vehicles	0.07	0.11	0.04	0.07
Cons. goods/ food process.	0.07	0.04	0.07	0.04
Construction	0.17	0.05	0.37	0.10
Wholesale trade	0.07	0.07	0.05	0.07
Retail	0.07	0.03	0.05	0.04
Transport/Communication	0.10	0.03	0.06	0.03
Financial services	0.17	0.32	0.09	0.22
Domestic services	0.05	0.02	0.04	0.03
Social services	0.04	0.15	0.05	0.22
Public authorities	0.01	0.02	0.02	0.04
Previous type of occupation (Reference: Agricultural work)				
Blue-collar work	0.53	0.05	0.66	0.12
Salesmen	0.07	0.06	0.04	0.06
Technical work	0.06	0.35	0.03	0.29
Clerical work	0.06	0.11	0.03	0.10
White-collar work	0.05	0.26	0.02	0.16

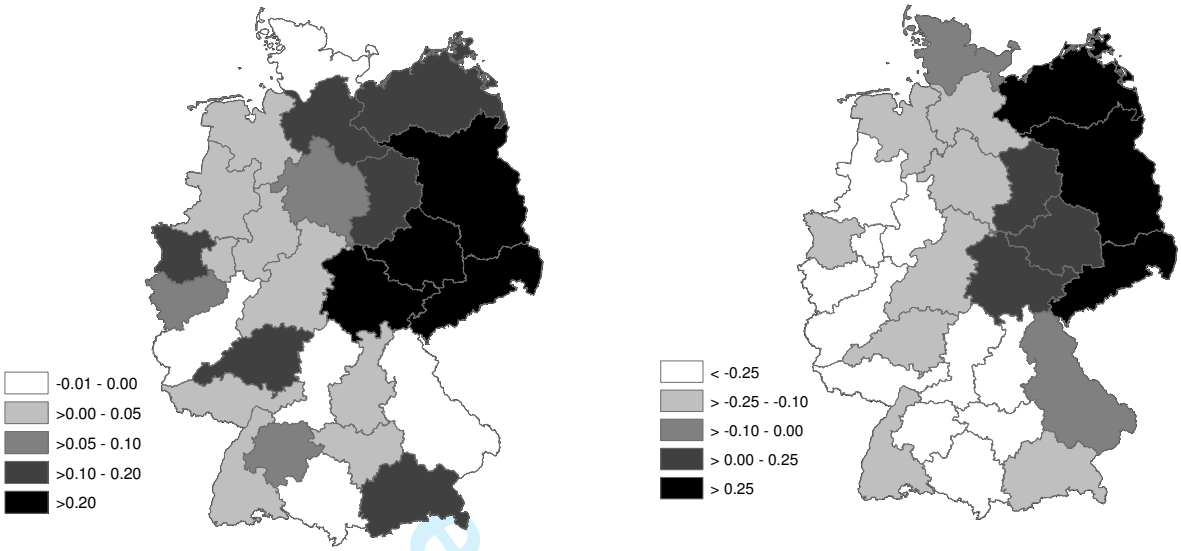
Health-related/Teaching/Consulting	0.02	0.12	0.01	0.18
Other service jobs	0.20	0.05	0.16	0.07
Year of job move (Reference: 1995)				
1996	0.13	0.11	0.15	0.14
1997	0.13	0.12	0.17	0.15
1998	0.13	0.14	0.15	0.15
1999	0.15	0.17	0.15	0.15
2000	0.16	0.18	0.13	0.13
2001	0.15	0.18	0.13	0.13
# of job moves	96,061	21,045	79,745	5,432

[a] Sample averages refer to sample shares as all covariates are dummy variables.

[b] Wage quintile of all full time employees observed on January 1st of each year (Data: IAB-R01).

[c] Indicator whether an individual contributes two or more observations (i.e. job moves) to the sample.

D – Maps showing marginal effects of regional dummies for high-skilled (left) and less-skilled (right) job movers



The maps suggest some spatial pattern in the attractiveness of a destination with respect to time-constant unobserved factors that are captured by the regional dummies. In particular, for less-skilled job movers, eastern Germany appears to be a more attractive destination than is captured by the observables in the estimation. For high-skilled job movers, a similar pattern can be found. However, some core urban regions (Munich, Frankfurt, and Cologne/Bonn) in western Germany also attract high-skilled job movers beyond what is found by the observables.

E – Four macro regions (aggregated from Figure 1)

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Table 1: Lower level marginal effects $\partial P_{id\,|m} / \partial_{z_{id}}$ by skill level for a pooled sample of JJC and UJC in percentage points (pp), IAB-R01 1995-2001[a]

	Model A		Model B		
Variable	LS[b]	HS[b]	LS[b]	HS[b]	p-value[c]
Median sector wage	0.057	1.359**	0.532*	2.054**	0.045
Wage variation	-0.222	-0.024	-0.385**	0.030	0.192
Unemployment rate	-0.452†	-0.150	-1.256**	-0.580	0.250
Employment growth	0.645**	0.175	0.137	0.209†	0.543
Share of HS employment	0.704**	1.294**	0.619†	-0.560	0.134
Log(Distance)	-6.448**	-4.665**	-6.132**	-4.318**	0.167
Population size	1.271**	1.369**	0.395**	0.492**	0.501
Population density	-0.221†	-0.315**	-0.230*	-0.187†	0.587
Crime Rate	0.292†	0.378**	-0.038	0.094	0.380
Hotel capacity	0.256*	0.206*	-0.949**	0.547	0.109
Child care facilities	-0.093	-0.080	0.062	0.595**	0.154
Land prices	0.120	0.176	-0.121	-0.268	0.507
East-West migration			4.207	-1.861	0.181
West-East migration			-3.691**	-2.644**	0.359
South-North migration			0.347	0.422	0.751
North-South migration			-0.073	0.255	0.494
27 destination dummies	No	No	Yes	Yes	
East[d]			3.68	21.74*	0.184
Mid[d]			-2.33**	5.94	0.163
North[d]			-1.95**	5.04	0.165
South[d]			-2.32**	3.80	0.137
LL (Lower level)	-86,744.6	-28,774.3	-85,443.2	-28,378.4	
# of regional moves	31,500	10,229	31,500	10,229	
IIA fails[e] (Small-Hsiao)	8/27	3/27	0/27	0/27	

Significance level: †:10% *: 5% **: 1%

[a] Marginal effects and standard errors have been calculated as sample averages.

[b] LS: Less-skilled individuals with high-school degree or vocational training; HS: High-skilled individuals with tertiary education.

[c] p-values refer to test of significance of difference between high- and less-skilled.

[d] The reference destination region is the most northern region along the Danish border. All marginal effects are plotted in Appendix D. The table contains only the average marginal effect and standard error for four macro regions (Appendix E).

[e] Number of regions (out of 27) for which IIA fails at a significance level of 5%.

Table 2: Lower level marginal effects $\partial P_{id\backslash m} / \partial_{z_{id}}$ by skill level and type of job mover in percentage points (pp), IAB-R01 1995-2001[a]

	Less-skilled[b]			High-skilled[b]		
Variable	JJC	UJC	p-value[c]	JJC	UJC	p-value[c]
Median sector wage	0.62*	0.36	0.40	2.22**	1.41**	0.23
Wage variation	-0.24†	-0.50**	0.27	-0.06	0.33	0.34
Unemployment rate	-0.90**	-1.16*	0.53	-0.59	-0.56	0.88
Employment growth	0.51*	-0.14	0.15	0.24†	0.12	0.55
Skill level	0.22	1.24**	0.22	-0.88	0.09	0.38
Log(Distance)	-6.06**	-6.26**	0.69	-4.22**	-4.65**	0.49
Population size	0.57**	0.23†	0.19	0.57**	0.24	0.37
Population density	-0.24*	-0.23†	0.79	-0.20†	-0.15	0.70
Crime Rate	0.02	-0.14	0.35	0.19	-0.23	0.28
Hotel capacity	-0.61*	-1.16**	0.28	0.39	0.92	0.50
Child care facilities	0.36*	-0.19	0.16	0.72*	0.27	0.35
Land prices	-0.07	-0.26	0.45	-0.28	-0.24	0.80
East-West migration	3.39	5.63	0.50	-2.00†	-1.39	0.53
West-East migration	-3.45**	-3.93**	0.56	-2.69**	-2.44*	0.69
South-North migration	0.48	0.14	0.54	0.48	0.17	0.53
North-South migration	-0.10	-0.01	0.75	0.46	-0.38	0.33
27 destination dummies	Yes	Yes		Yes	Yes	
East[d]	3.51	1.05	0.51	23.55†	16.61	0.62
Mid[d]	-1.61*	-3.29**	0.24	6.67	4.00	0.58
North[d]	-1.22	-2.77**	0.26	5.23	4.47	0.75
South[d]	-1.76**	-3.15**	0.28	4.90	1.24	0.43
LL (Lower level)	-53,681.5	-31,618.5		-22,401.5	-5,947.5	
# of regional moves	19,927	11,573		8,092	2,137	
IIA fails[e] (Small-Hsiao)	0/27	0/27		2/27	0/27	

Significance level: †: 10% *: 5% **: 1%

[a, b, d, e] See notes in Table 1.

[c] p-values refer to test of significance of difference between JJC and UJC.

Table 3: OLS estimates for percentage point change of destination-specific marginal effects from estimation B in Table 1

			interacted with high-skilled	
Covariate	Coef.*100	t-value[a]	Coef.*100	t-value[a]
High-skilled	9.32	7.66		
Average[b] population density	0.65	1.32	4.07	1.97
Average[b] share of service jobs	2.29	4.97	6.63	3.53
Average[b] GDP per head	-3.28	-5.08	-5.54	-2.48
January temperature[c]	-2.18	-6.26	-7.55	-3.30
July temperature[c]	0.48	1.49	4.57	3.82
Constant	-0.85	-2.50		
Observations	54			
R-squared	0.79			

[a] Heteroscedasticity-robust jackknife standard errors.

[b] Yearly information from the Statistisches Bundesamt averaged across the 7-year observation period.

[c] Climate data from the German weather service (Deutscher Wetterdienst)

Table 4: Upper level marginal effects for specification B by skill level and type of job move (in pp), IAB-R01 1995-2001[a]

	JJC & UJC		JJC		UJC	
Covariates	LS	HS	LS	HS	LS	HS
Age 25-30	0.85*	5.23**	1.21**	4.73**	0.27	5.19**
Age 30-35	1.09**	4.17**	1.30**	3.40**	0.80*	6.78**
Age 40-45	-0.07	-3.84**	-0.11	-4.54**	-0.06	-2.10
UJC	-1.92**	4.65**	n/a	n/a	n/a	n/a
Unskilled	-2.02**	n/a	-2.27**	n/a	-1.47*	n/a
Born in East Germany	9.26*	-3.14	9.05†	-3.31	9.27*	-2.20
2nd wage quintile	0.19	-6.35**	0.02	-7.60**	0.28	-2.38
3rd wage quintile	2.06**	-2.06*	2.75**	-3.31**	1.29	2.03
4th wage quintile	5.72**	3.78**	6.45**	2.63†	4.90**	7.36**
5th wage quintile	12.9**	9.45**	13.73**	7.48**	14.6**	18.2**
Average tenure	-0.75**	-0.88**	-0.78**	-1.05**	-0.68**	0.21
Month non-employed	-0.13	-0.50*	-0.28**	-0.37	-0.05	-0.71**
Previous recall	-16.4**	-20.5**	-3.11**	-6.04*	-16.3**	-35.5**
Multiple job moves	1.02**	-1.12	1.92**	-0.80	-0.10	-2.27
1996	-1.00*	-0.51	-0.44	1.00	-1.18*	-5.35
1997	-0.44	1.86	-0.22	2.74*	-0.15	-0.60
1998	0.54	2.37*	0.37	2.67**	1.19†	2.17
1999	0.44	2.62†	0.85	2.87	0.45	2.52
2000	2.03**	1.82	2.20*	1.52	2.46**	5.20*
2001	1.87**	3.27*	2.35**	3.21†	1.94**	4.96†
Other covariates[b]	*X*	*X*	*X*	*X*	*X*	*X*
Incl. value param. ζ_m [c]	0.31**	0.47**	0.28**	0.46**	0.34**	0.29**
LL (upper level)	-77,591.0	-16,904.7	-47,163.3	-13,475.5	-29,849.8	-3344.9
# of job moves	175,806	26,477	96,061	21,045	79,745	5,432

Significance levels: †: 10% *: 5% **: 1%

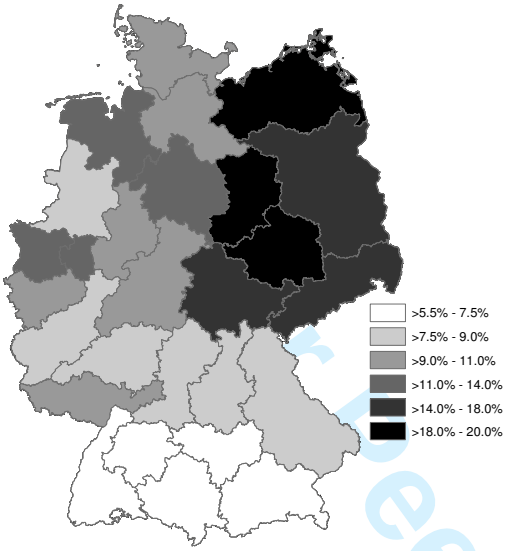
[a] Marginal effects and standard errors have been calculated as sample averages. See previous section for details.

[b] Includes 13 sector of activity dummies, 9 occupation dummies, 27 origin dummies. Full estimation results are available from the author upon request.

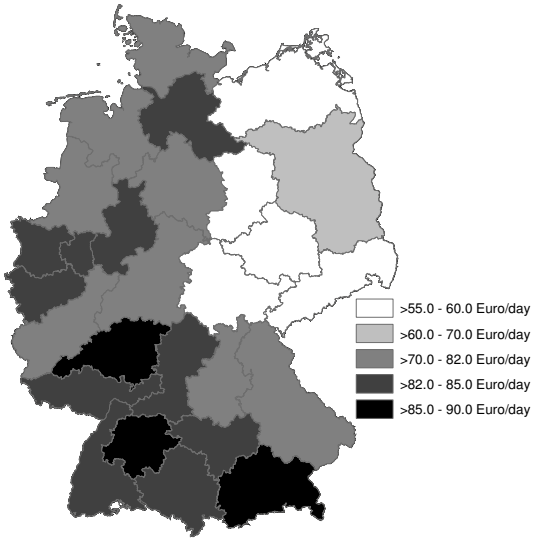
[c] Displays coefficient estimate instead of marginal effect.

Figure 1: Aggregated planning districts

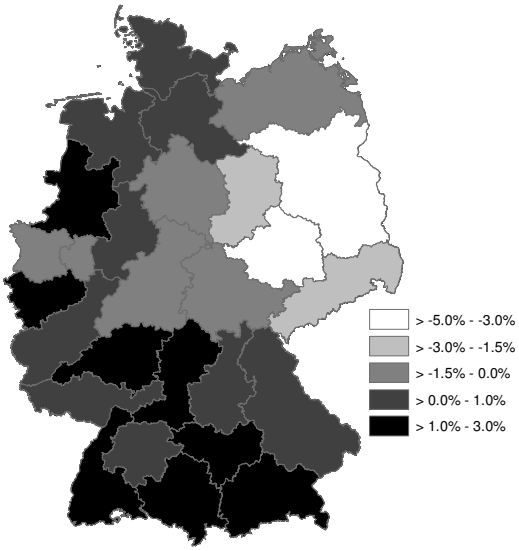
Figure 2: Average economic conditions, 1995 – 2001 (Source: see Appendix A)



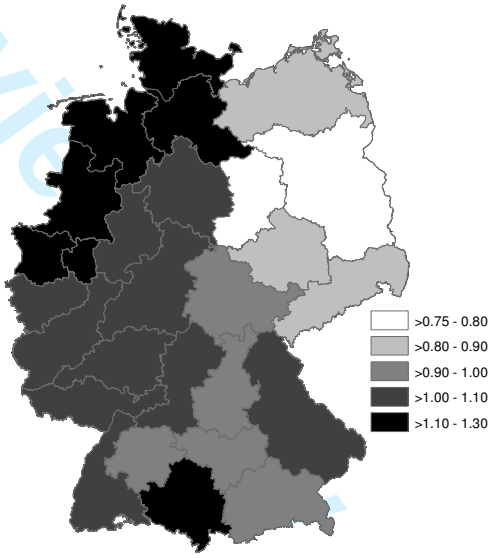
(i) Average unemployment rate



(iii) Median daily gross wage

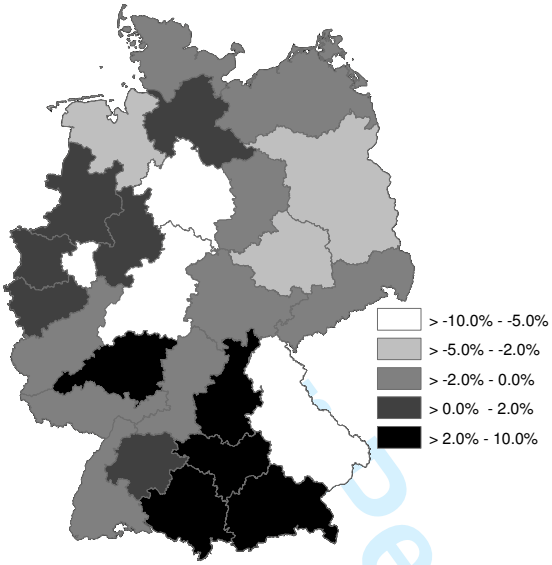


(ii) Average employment growth

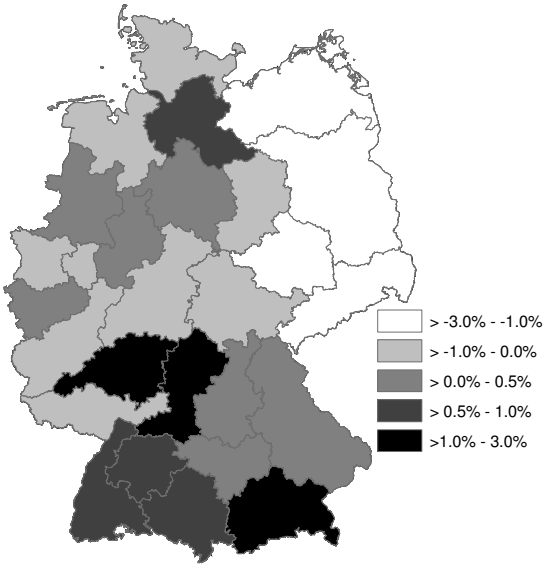


(iv) Wage variance index (<1: below average)

Figure 3: Employment change by skill level induced by net migration flows, IAB-R01, 1995 - 2001 (as a share of employees by skill level at the beginning of the observation period, 01/01/1995)



(i) High-skilled job movers



(iii) Less-skilled job movers

Notes

[1] Extending the analysis to endogenously model the probability of changing jobs is not feasible with the data used and is thus left for future research.

[2] This only holds if an individual ranks equally in the skill distribution across all regions.

[3] Mortensen and Neumann (1988) show that an acceptable wage offer for a worker has to exceed his current wage which should exceed the reservation wage of an identical unemployed individual.

[4] Details on the aggregation procedure are available from the author upon request.

[5] As pointed out by an anonymous referee, this aggregation may affect the estimation results due to the Modifiable Areal Unit Problem (MAUP, see for instance Fotheringham and Wong, 1991). Due to the limits to the estimability of the model with a more disaggregated regional classification, I cannot easily examine the relevance of the MAUP. However, as some indication of the robustness of results to the MAUP, re-estimation of the destination choice model with an even coarser spatial resolution (16 German Länder) did not substantially affect the findings.

[6] A company may have different establishment identifiers due to multiple locations as well as due to changes of the legal status of the company or a re-organization of its establishment structure. Thus a change in the establishment identifier need not always correspond to a change of employer. However, job moves included in the analysis are conditioned on the employer reporting an “end of employment”. Except for cases in which an employer spuriously reports an “end of employment” despite the employment relationship continuing in just another legal setting or at another workplace, the sample should include job moves that correspond to changes in employers. The IAB has launched a research project to examine the relevance of such reporting, but no evidence is available yet.

[7] See Fitzenberger and Wilke (2004) for a discussion.

[8] Estimates for female job movers are available from the author upon request.

[9] There may be multiple job moves by one individual during the observation period. These are treated as independent observations conditional on covariates. An alternative sampling approach

with only one randomly drawn job move per individual resulted in similar findings suggesting that this independence assumption is a feasible approach.

[x] A less restrictive specification with additional origin-specific characteristics in the upper-level model did not converge when estimated simultaneously.

[xi] Unfortunately, no regionally disaggregated unemployment rates by skill group are available.

[xii] When using the regional wage level across all sectors, estimates turned out to be similar, but weaker.

[xiii] Following a methodology by Hunt and Mueller (2002), both income indicators have been estimated based on the IAB-R01 and control for different regional compositions of the labour force such that differences in these indicators reflect differences in labour prices only.

[xiv] Ciccone and Hall use employment density instead, but population densities should be a similar indicator.

[xv] Positive agglomeration effects such as higher productivity levels due to closer proximity of workers and lower transportation cost should mainly be captured by the regional wage distribution.

[xvi] As discussed in Small and Hsiao (1985), the Small Hsiao test should be preferred to the Hausman test because it avoids the computational and inference problems.

[xvii] Thus, there also seems to be no need to look for alternative specifications where one allows for hierarchical choice sets that are linked to the accessibility of places or the ordering of central places as discussed in Fotheringham (1986) and Fik and Mulligan (1990). Moreover, there also seems to be no need to allow for more general spatial patterns of substitution between the destinations. However, as pointed out by an anonymous referee, this is likely to be the case due to the fixed effects approach applied in the analysis. Alternatively, one can explicitly allow for spatial patterns of substitution in choice modelling as reviewed in Hunt et al. (2004).

[xviii] As an alternative to specifying the destination choice model with destination dummies (specification B), I included these time-constant regional covariates instead. The resulting estimates are quite similar to the estimates for specification A in Table 3 and 4. This suggests additional time invariant heterogeneity that is not captured by the time-constant covariates. I thus

prefer the inclusion of destination dummies in order to reduce biases from omitted variables and conduct this second stage analysis instead. Estimates for the alternative lower level specification are available from the author upon request.

[xix] I ran the specification using only the 30 destination-specific effects whose marginal effect is significant at a 10% level. Since estimates were quite similar, results are shown for the full sample of marginal effects only, but results for the restricted sample are available from the author upon request.

[xx] According to MacKinnon and White (1985), the jackknife procedure performs better in small samples than alternative estimators.

[xxi] The wage change that keeps the probability of moving to k constant if distance increases is calculated by rearranging the total derivative of the utility with respect to changes in wages and distance in order to compute the marginal rate of substitution between distance and wages as $\frac{d\ wage}{d\log(km)} = -\frac{\partial P_{iok|m} / \partial \log(km)}{\partial P_{iok|m} / \partial wage}$ and $\frac{\partial wage}{\partial km} = \frac{\partial wage}{\partial \log(km)} \frac{1}{km}$.